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(54) A Ruminant Bolus Comprising Particulate Matter and a Rapidly Dissolving Binder

(57) A food supplement bolus for a ruminant animal comprising a moulded block of a solid, non-toxic binding substance, such as a sugar, salt or starch, and relatively high density particulate matter, preferably copper oxide and/or elemental zinc. The bolus may also have a coating such as caster sugar or Carnauba wax. The binding substance is selected so as to dissolve relatively rapidly, in less than a week and ideally within one hour, in a ruminant stomach allowing the particulate matter to be deposited therein. A double bolus may also be provided in which each bolus may contain different biologically active ingredients. There are also described methods for moulding boluses.

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Bolus for Supplying Biologically Beneficial Substances to Ruminant Animals

This invention relates to a bolus for supplying biologically beneficial substances, such as trace elements, to ruminant animals such as cattle, sheep, goats and deer.

Particulate materials of high density, for example rods or filaments of oxidised copper, are administered by mouth to ruminant animals for the purpose of nutritional supplementation or medicinal treatment, more especially for the treatment of trace element deficiencies.

Such orally administered high density particulate material is employed because particles of appropriate size and density lodge for prolonged periods in the ruminant stomachs. Slow solution of the active substance, e.g. trace element or trace elements, takes place. The duration for which the active substance remains effective can extend to several months and, for example, up to one year in the case of a copper oxide particulate.

Oral administration of these high density particulate materials is especially suitable for ruminant animals grazed extensively, handled infrequently and not receiving supplementary feeding.

Material such as particulate copper oxide rods or filaments is normally administered in the form of individual doses. The appropriate dose is commonly contained within a capsule of gelatin, which dissolves rapidly in the ruminant stomach. The filled gelatin capsule is of high relative density, usually 2 or more, which prevents it from being regurgitated. The gelatin typically dissolves within about 15 minutes, when in contact with the aqueous contents of the rumen or reticulum, and the released particles, being of high density, tend to sink to the

bottom of whichever part of the ruminant stomach they are in. The particulate character and weight of the beneficial material causes very delayed passage through the parts of the ruminant stomach, lasting up to several months, thus giving prolonged effective treatment from a single administered dose.

Exissting boluses are relatively expensive, mainly due to the high cost of the gelatin capsules when compared with the cost of the material to be administered.

The present invention therefore has as a principal object to provide an alternative and less expensive bolus for administration to ruminant animals.

According to the invention there is provided a bolus comprising a dose of a relatively high density particulate of a substance beneficial to a ruminant animal, carried by a bolus-shaped block of a solid, non-toxic binding substance which will dissolve relatively rapidly in the ruminant stomach.

Suitable binding substances are, for example, sugar, salt such as rock salt or cellulose/gum or gelatin mixtures. Powdered salt is a preferred binding substance.

The block of the binding substance is preferably formed, as by moulding, into a cylindrical shape, rounded at least at one end in order to facilitate passage through the gullet of the animal.

As stated, it is essential that the binding substance be one which dissolves relatively rapidly in the ruminant stomach. The dissolving period, and thus release of the particulate material, should occur within seven days, preferably less than one day, more preferably less than two hours, and ideally within between five and sixty minutes. The binding substance is selected accordingly.

Examples of particulate materials which may be carried by the binding substance forming the bolus are particulate copper oxide, preferably in the form of rods or filaments, and elemental zinc. The relative density and size of the particulate are such as to ensure prolonged residence in the ruminant stomach, i.e. residence for a period of not less than one month of a useful proportion of the administered dose.

According to a further optional feature of the invention, the bolus is coated with a non-sticky coating which, after administration of the bolus, is removed by solution or abrasion. One suitable coating material is caster sugar, applied for example in a coating pan. Other possible coating materials are thinly applied shellac, for example applied as shellac emulsion, and a wax such as Carnauba Wax, which may also be applied as an emulsion.

According to a still further feature of the invention, the above-described bolus for administration of particulate material such as copper oxide or zinc, is combined into a double bolus with a bolus of a resin material, preferably a rosin, which incorporates at least one different biologically (pharmaceutically or medicinally) beneficial substance for a ruminant animal. Examples of such different biologically beneficial substances are selenium compounds, cobalt compounds, iodine compounds, manganese or compounds thereof, zinc compounds such as zinc oxide for control of fungal toxicoses, vitamins, lipids, amino-acids and medicaments such as anthelmintics.

The double bolus may be produced in a variety of ways, for example by moulding the sugar or like bolus formed of a dissolving binding substance around the rosin bolus, or vice versa, by fixing the two boluses together end to end with a soluble or dissembling binding tape, or fixing the two boluses end to end in a cardboard or like disintegrating or dissolving connecting tube.

According to another aspect of the invention, there is provided a method of producing a bolus for supplying a biologically beneficial substance to a ruminant animal, according to which a mould, having a bolus-shaped chamber and reservoir space, is filled with a meltable powder capable of forming a binding substance and a dose of a relatively high density particulate of a material beneficial to a ruminant animal, the mould is heated, with the reservoir above the bolus chamber, to melt the powder and enable the melted powder and the beneficial material to fall and condense into the bolus chamber with limited protrusion into the neck, the mould is cooled to allow the melted powder to solidify into a solid block of binding substance carrying the beneficial particulate material, the mould is opened to enable the moulded bolus to be extracted, and the moulded bolus is trimmed of any protrusion.

According to still another aspect of the invention, there is provided a method of producing the bolus, especially in the case where powdered salt is employed as the binding substance, according to which the binding substance is moulded with a dose of a relatively high density particulate of a material, for example copper oxide filaments or needles, beneficial to a ruminant animal, the mixture being wetted by a relatively small quantity of water or an aqueous solution of a non-toxic solvent, the mixture is compressed into a mould having a bolus shaped moulding chamber, the mould is heated to drive off the water, and the bolus is extracted from the mould after cooling.

Preferably, the bolus chamber is cylindrical with a rounded end.

Preferably, in the first method, the mould is loaded first with powder for forming the binding substance, then with the particulate of beneficial material, and optionally then with further powder for forming the binding substance.

When the mould is heated and the powder for forming the binding substance melts

and condenses into the bolus chamber, the relatively heavy particulate of beneficial material tends to sink into the melted powder, thereby to form a bolus having the particulate beneficial material embedded therein, especially in a central region of the length of the bolus.

Boluses and methods of production thereof in accordance with the invention are now further described by way of example.

Example 1

15 g of granulated sugar and 20 g of copper oxide particles, in the form of rods or filaments of approximately 0.5 mm diameter and 2 to 5 mm in length, were placed in a split silicon rubber mould having a bolus chamber connected through a short neck to an overhead reservoir chamber. 10 g of sugar were first loaded into the mould, followed by the copper oxide particles, followed by 5 g of sugar at the top. The sugar used may be sucrose, lactose, glucose or fructose, for example, or a crude mixture such as molasses may alternatively be employed.

After shaking or vibration, the filled mould was placed in a fan oven, at 155 degrees C, for a period of 2½ hours.

The constituents of the mould settled into the bolus chamber with melting of the sugar, with a small protrusion upstanding at the neck. The mould was subsequently slowly cooled, and the bolus extracted and trimmed.

The resultant bolus, of cylindrical shape with moulded ends (resulting from the shape of the bolus chamber) constituted a solid block of binding material (re-solidified sugar) in which the copper particles were embedded, mainly in a central region of the length of the bolus.

As an optional step, a surface coating of Carnauba Wax was applied by repetitive spraying.

The bolus was tested by placing it in water at 37 degrees C and shaking gently on a planetary shaker. The bolus was found to disintegrate, by solution of the binding material, within 15 minutes, releasing the copper oxide particles.

It has been found possible to combine the above-described bolus of dissolving binding material with a resin, most preferably a rosin, bolus, in which the rosin acts as a binding substance in which a different biologically beneficial substance is uniformly dispersed. In use, the rosin bolus remains in the alimentary tract over a long period, the beneficial substance being slowly released by leaching over this long period.

The double bolus may be produced by moulding the sugar or equivalent bolus around the rosin bolus, or vice versa, or by fixing the two single boluses end to end using a dissolving tape or a cardboard connecting tube.

Example 2

25 g of copper rods or filaments as previously referred to are mixed with 6 g powdered salt, 0.2 g cereal flour, 0.1 g pectin and 2 g gum arabic, together with 4 ml water as a wetting agent. The wet mixture is tamped into a mould having a bolus shaped moulding chamber. The mould is then heated to drive off water and the resultant solid bolus extracted after cooling.

Example 3

The same method as Example 2 is employed, but with a mixture comprising 25 g copper particulate, 12 g powdered salt, 0.2 g cereal flour, 0.1 g pectin and 4 ml

water.

Example 4

The same method as Examples 2 and 3 is employed, but with a mixture comprising 25 g copper particulate, 4 g powdered salt, 0.2 g cereal flour, 0.1 g pectin, and 4 ml water.

In general, in the second method exemplified by Examples 2 to 4, it is preferred to employ a ratio by weight of binding material, salt and starch for example, to copper needles, in the range 3:1 to 1:10, preferably 2:1 to 1:6, mixed with ½ to 20 ml, preferably 3 to 10 ml water or any aqueous solution of a non-toxic solution, preferably saturated, of a solute such as magnesium sulphate, cobalt chloride, sodium chloride, sodium silicate or potassium iodide.

Instead of employing salt and starch as the binding substance, the starch can be replaced by microcrystalline cellulose, agar-agar, a gum such as xanthan, pectin or cereal flour, or any combination thereof with or without the starch, as typified by the examples.

Assuming the use of powdered salt and starch, the amount of salt used for a bolus to carry 25 g copper particulate is between 1 g and 10 g, preferably 2 g and 6 g, whilst the amount of starch used is in the range 1 g to 20 g, preferably 3 g to 10 g.

It has also been possible to prepare the sugar-based bolus of Example 1 by the second method, using a small quantity of saturated sugar solution as a wetting agent.

Claims

1. A bolus for supplying a biologically beneficial substance to a ruminant animal, comprising a bolus-shaped block of a solid, non-toxic binding substance which will dissolve relatively rapidly in the ruminant stomach and in which a dose of a relatively high density particulate of the beneficial substance is incorporated.

2. A bolus according to claim 1, formed by moulding as a cylindrically shaped block rounded at least at one end.

3. A bolus according to claim 1 or claim 2, in which the binding substance has a dissolving period in the ruminant stomach not exceeding seven days.

4. A bolus according to any of claims 1 to 3, in which the biologically beneficial substance incorporated in the bolus is particulate copper oxide and/or particulate zinc.

5. A bolus according to any of claims 1 to 4, in which the rapidly dissolving binding substance is powdered salt or sugar.

6. A bolus according to any of claims 1 to 5, having in combination therewith a bolus formed of a resin material having a different biologically beneficial substance incorporated therein.

7. A bolus according to claim 6, in which the rapidly dissolving bolus is formed around the rosin bolus.

8. A bolus according to any of claims 1 to 7, in which the rapidly dissolving bolus is coated with a non-sticky coating which in use is removed by solution or by abrasion.

9. A method of producing the bolus of any of claims 1 to 8, according to which a mould, having a bolus-shaped chamber and a reservoir chamber connected by a neck, is filled with a meltable powder capable of forming a binding substance and a dose of a relatively high density particulate of a material beneficial to a ruminant animal, the mould is heated, with the reservoir above the bolus chamber, to melt the powder and enable the melted powder and the beneficial material to fall and condense into the bolus chamber with limited protrusion into the neck, the mould is cooled to allow the melted powder to solidify into a solid block of binding substance carrying the beneficial particulate material, the mould is opened to enable the moulded bolus to be extracted, and the moulded bolus is trimmed of any protrusion.

10. A method of producing the bolus of any of claims 1 to 8, according to which the binding substance is moulded with a dose of a relatively high density particulate of a material, for example copper oxide filaments or needles, beneficial to a ruminant animal, the mixture being wetted by a relatively small quantity of water or an aqueous solution of a non-toxic solvent, the mixture is compressed into a mould having a bolus shaped moulding chamber, the mould is heated to drive off the water, and the bolus is extracted from the mould after cooling.

Amendments to the claims have been filed as follows

1. A bolus for supplying a biologically beneficial substance to a ruminant animal, comprising a bolus-shaped block of a solid, non-toxic binding substance which will dissolve relatively rapidly in the ruminant stomach and in which a dose of a relatively high density particulate of the beneficial substance is incorporated, wherein the rapidly dissolving binding substance is powdered salt or sugar.

2. A bolus according to claim 1, formed by moulding as a cylindrically shaped block rounded at least at one end.

3. A bolus according to claim 1 or claim 2, in which the binding substance has a dissolving period in the ruminant stomach not exceeding seven days.

4. A bolus according to any of claims 1 to 3, in which the biologically beneficial substance incorporated in the bolus is particulate copper oxide and/or particulate zinc.

5. A bolus according to any of claims 1 to 4, having in combination therewith a bolus formed of a resin material having a different biologically beneficial substance incorporated therein.

6. A bolus according to claim 5, in which the rapidly dissolving bolus is formed around the rosin bolus.

7. A bolus according to any of claims 1 to 6, in which the rapidly dissolving bolus is coated with a non-sticky coating which in use is removed by solution or by abrasion.

8. A method of producing the bolus of any of claims 1 to 7, according to which

a mould, having a bolus-shaped chamber and a reservoir chamber connected by a neck, is filled with a meltable salt or sugar capable of forming a binding substance and a dose of a relatively high density particulate of a material beneficial to a ruminant animal, the mould is heated, with the reservoir above the bolus chamber, to melt the powder and enable the melted powder and the beneficial material to fall and condense into the bolus chamber with limited protrusion into the neck, the mould is cooled to allow the melted powder to solidify into a solid block of binding substance carrying the beneficial particulate material, the mould is opened to enable the moulded bolus to be extracted, and the moulded bolus is trimmed of any protrusion.

9. A method of producing the bolus of any of claims 1 to 7, according to which the binding substance of salt or sugar is moulded with a dose of a relatively high density particulate of a material, for example copper oxide filaments or needles, beneficial to a ruminant animal, the mixture being wetted by a relatively small quantity of water or an aqueous solution of a non-toxic solvent, the mixture is compressed into a mould having a bolus shaped moulding chamber, the mould is heated to drive off the water, and the bolus is extracted from the mould after cooling.

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The Patent Office

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): A5B (BLF, BLL)

Int Cl (Ed.6): A61K 9/00

Other: ONLINE: QUESTEL/EDOC & WPIL; DIALOG/WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2271282 A	(PORTER W L) page 3 lines 21-30; page 8 lines 23-27; Example 1	
X	GB 2158713 A	(ICI AUSTRALIA LTD.) page 2 lines 27-37; page 3 lines 1-16; Example 1	1-4
X	GB 2077103 A	(PITMANN-MOORE INC.) page 2 lines 10-15 & 85-121; figures 5-7; Example 9	1,6 & 8
X	GB 0936386 A	(WELLCOME FOUNDATION LTD.) page 1 line 69-page 2 line 2; page 2 lines 28-45; Examples 2,3,5,11 & 12	1,2,4,5 & 8
X	EP 0097507 A2	(UNI. GLASGOW) page 3 lines 16-26; page 4 lines 8-10; page 5 lines 22-34; Examples 1-4	1,4 & 8
X	US 5252561	(HOECHST) column 1 lines 8-14; column 2 line 65-column 3 line 3; column 5 line 39-column 6 line 32; column 7 lines 23-42; Examples 1-3	1,2,5 & 6
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X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
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P Document published on or after the declared priority date but before the filing date of this invention.
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